ARKANSAS POWER & LIGHT COMPANY
POST OFFICE BOX 551 LITTLE ROCK, ARKANSAS 72203 (501) 371-4000

April 30, 1985

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Director of Nuclear Reactor Regulation
ATTN: Mr. James R. Miller, Chief
Operating Reactors Branch #3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Arkansas Nuclear One - Unit 2

Docket No. 50-368
License No. NPF-6
ICC Monitoring System
Installation-NUREG-0737 Item II.F.2

Gentlemen:

During the ANO-2 fourth refueling outage (2R4), AP&L intended to install all of the in-vessel hardware associated with the Inadequate Core Cooling (ICC) level monitoring system. As part of this installation, ports were to be cut in the two existing in-core instrument guide tubes in which the RADCAL gamma thermometer probes were to be installed. These ports were intended to segment the tubes into two separate manometers for the detection of collapsed water level in the plenum and dome regions. However, despite AP&L's best efforts, we were unable to make the cuts during this outage. Instead, the probes were modified to take advantage of existing slots in the tubes and installed on April 16, 1985. When AP&L recognized that we would be unable to make the cuts in the in-core instrument guide tubes and that the lack of these cuts would effect the characteristics of the ICC system as described to the NRC staff, we contacted the ANO-2 NRR Project Manager and appraised him of the situation. This letter is in response to his request to provide our assessment of the situation and describe our future plans.

AP&L had intended to cut four sets of slots in two in-core instrument guide tubes (core map locations E-8 and N-8 as shown in Figure 1). As shown in details A, B and C of Figure 2. the slots below the isolator provide a path for steam to escape the tube so that voids created in the tube or which enter the tube below the isolator are purged from the tube. These vents therefore minimize the amount of frothing in the upper tube region, thus improving the efficiency of the guide tube for collapsed level measurement.

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The slots above the isolator allow segmented drainage of the instrument tube to provide quicker tube drain time which corresponds to a faster instrument response time. With all of the slots in place, two distinct vessel areas for level monitoring would be created. One would be the area above the fuel alignment plate up to the upper guide structure (plenum region) and the other would be the area from the upper guide structure to the vessel head (dome region).

The cuts in the in-core instrument guide tubes were to be made using a technique referred to as mechanical disintegration of metal (MDM). This technique has been successfully used in the past to cut steam generator tubes and for core barrel bolt disintegration. The MDM process used at ANO involved mechanically vibrating an electrode to and from the tube wall. A high voltage source is applied to the electrode so that as it strikes the tube wall an arc is created. This arc heats the surface of the tube wall to a molten condition and as the electrode is pulled away from the surface a small portion of the surface metal is freed. This metal is then carried away by an air/water mixture which is passed through the tube at a high velocity during the arcing process.

Due to an inability to obtain the required air/water flow down the in-core instrument tube to flush away the metal particles removed by the MDM process, the cutter was rendered ineffective. Numerous attempts were made to correct the problem but none proved successful. AP&L also evaluated other techniques to cut the tubes but none were feasible considering ALARA constraints and available time. Based on our inability to correct the problem during the outage, the decision was made to modify the probe to take advantage of existing slots and gaps in the in-core instrument guide tube and proceed with the remaining hardware installation.

The existing slots in the in-core instrument guide tube, as shown in detail C of Figure 2, are five inches long and are located just above the fuel alignment plate. The gamma thermometer probes were modified to locate an additional isolator on the probe approximately one inch below the top of the slots so that the single slot, which was to serve only as a purge vent, would now provide both upper and lower porting at the fuel alignment plate. This porting along with an existing gap in the guide tube near the vessel head, as shown in detail A of Figure 2, provide the desired manometer effect from the fuel alignment plate to the dome of the reactor vessel. This design will not, however, provide the segmentation of the manometer which allows separate collapsed level measurements in the plenum and dome regions.

To determine the effect of the single manometer, AP&L plans to perform analysis to determine the void detection capability of the installed instrumentation with reactor coolant pumps operating and with reactor coolant pumps off. Additionally, the installed system will be modeled in the air water test facility which was originally used to perform the confirmatory test program to determine the optimum port configuration. Tests will be performed at various size line breaks to demonstrate the systems capability.

The schedule for the tests and analysis has yet to be determined. We do plan, however, to complete the tests and analysis in time to provide the necessary input to the system's software development which is scheduled to

be completed by the end of August 1985. A summary of the tests and analysis results will be provided to the NRC upon their completion.

If, as a result of the tests and analysis, it is determined that future modifications to the ICC system are necessary to meet the intent of the December 10, 1982 "Order for Modification of License" an evaluation of the most appropriate modification will be conducted. Prior to making any further modifications to the currently installed system, we will inform the NRC of our plans.

Although we were unable to completely install the in-core ICC level monitoring hardware as originally planned, AP&L is pleased that we were able to install the probes, as described above, some nine months prior to the original scheduled installation date. AP&L will continue working on the implementation of the remaining hardware modifications and the development of software for the ICC system in an effort to have the system available for operator use the last quarter of 1985.

Very truly yours,

J. Ted Enos
Manager, Licensing

JTE/DEJ

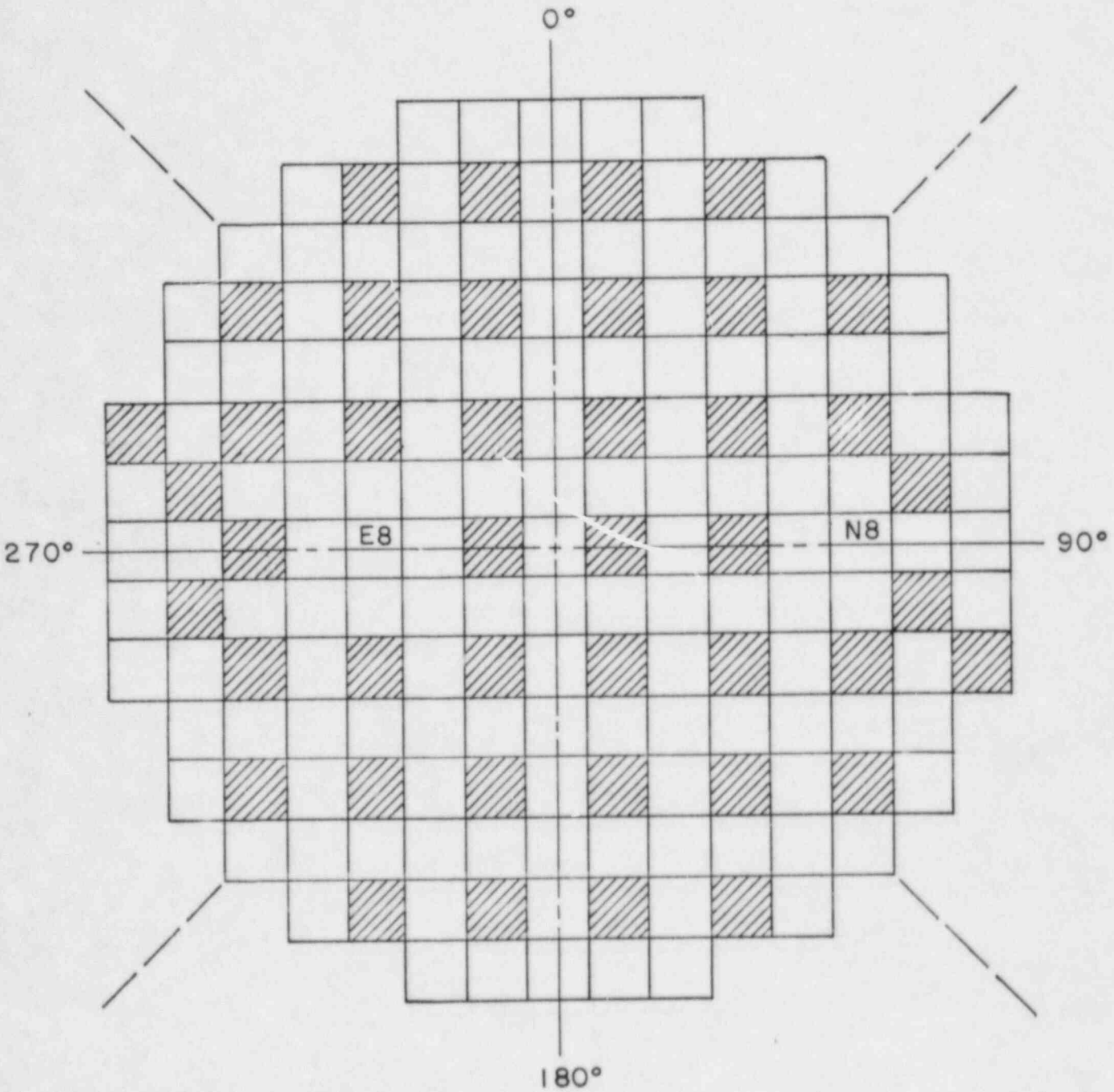
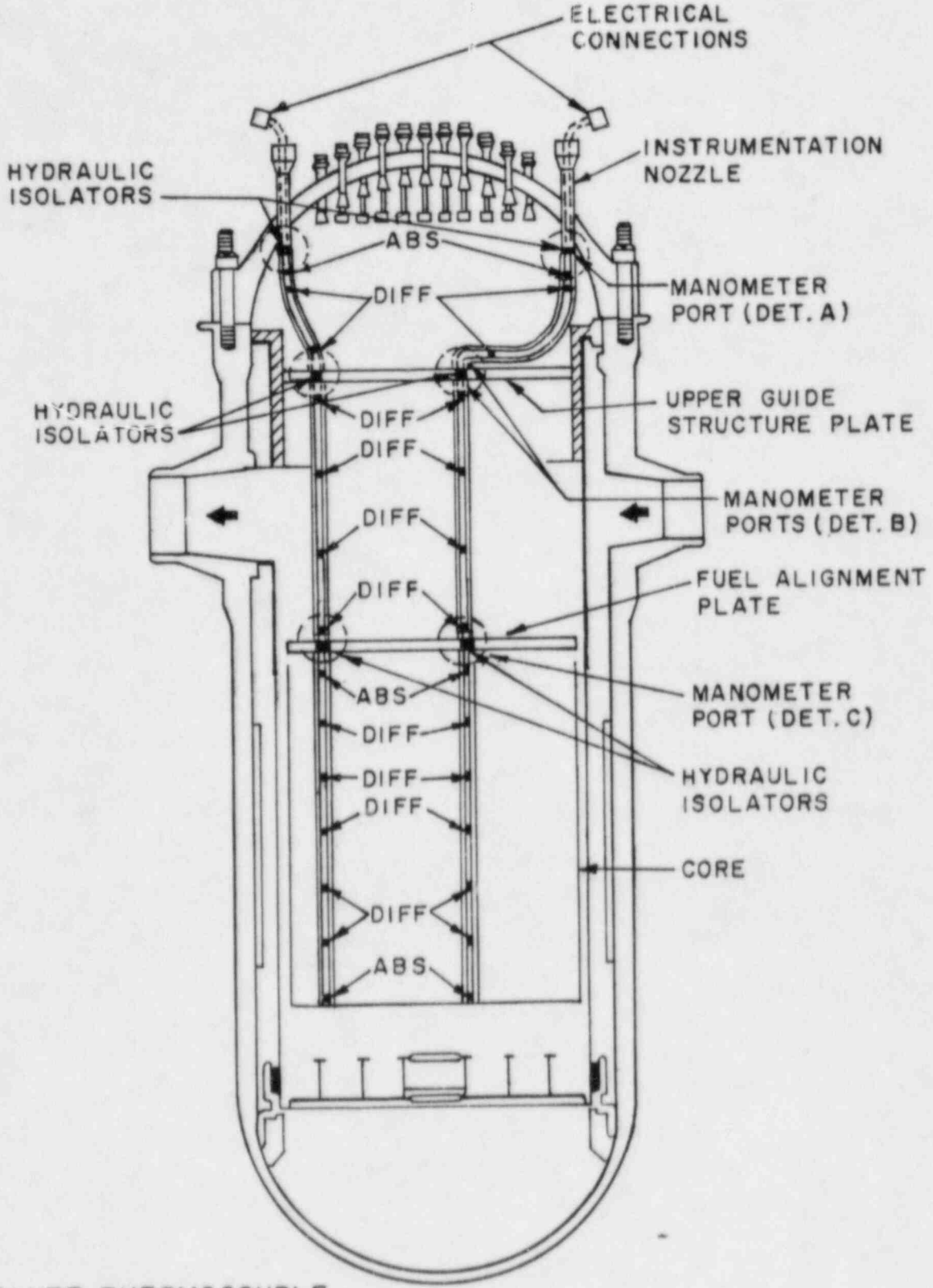


Figure 1 - ANO-2 ICC DETECTOR LOCATIONS



ABS - ABSOLUTE THERMOCOUPLE
DIFF - DIFFERENCE THERMOCOUPLE

Figure 2 - ANO-2 REACTOR VESSEL AND ICC DETECTORS

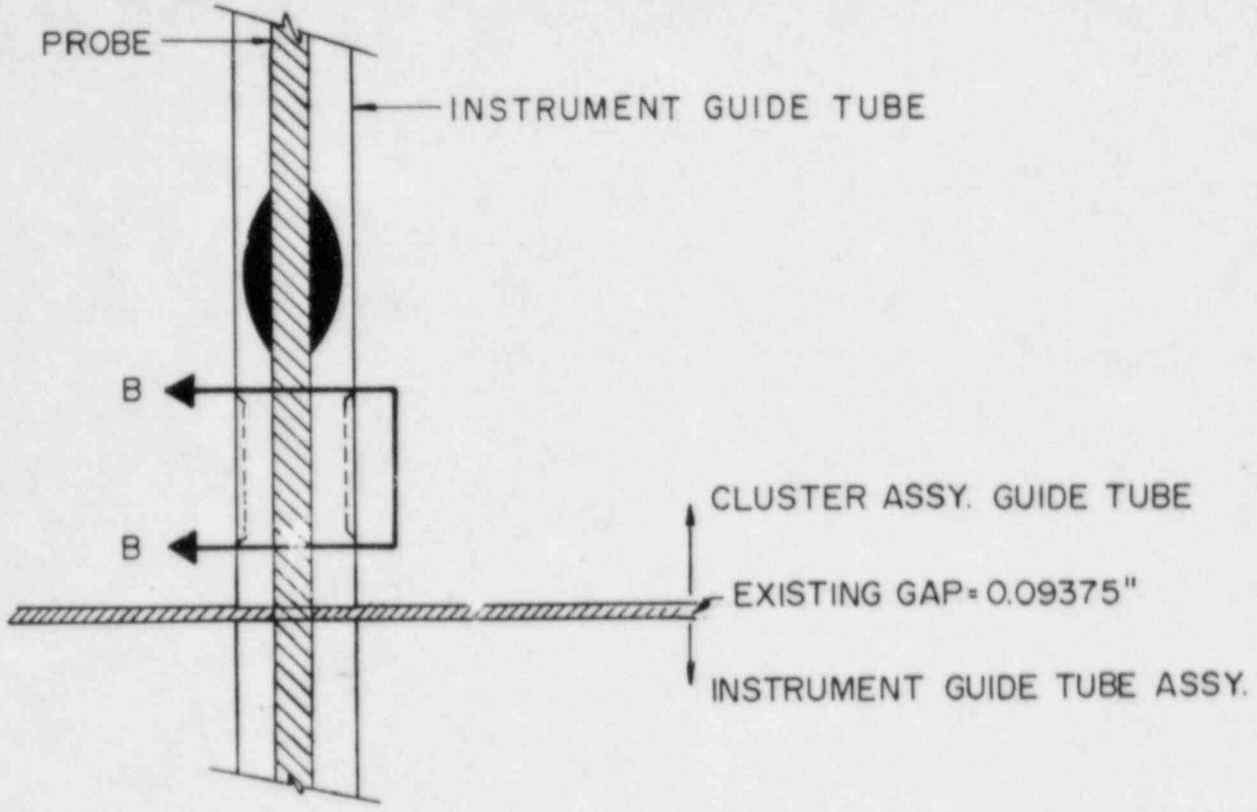


Figure 2 - DETAIL A

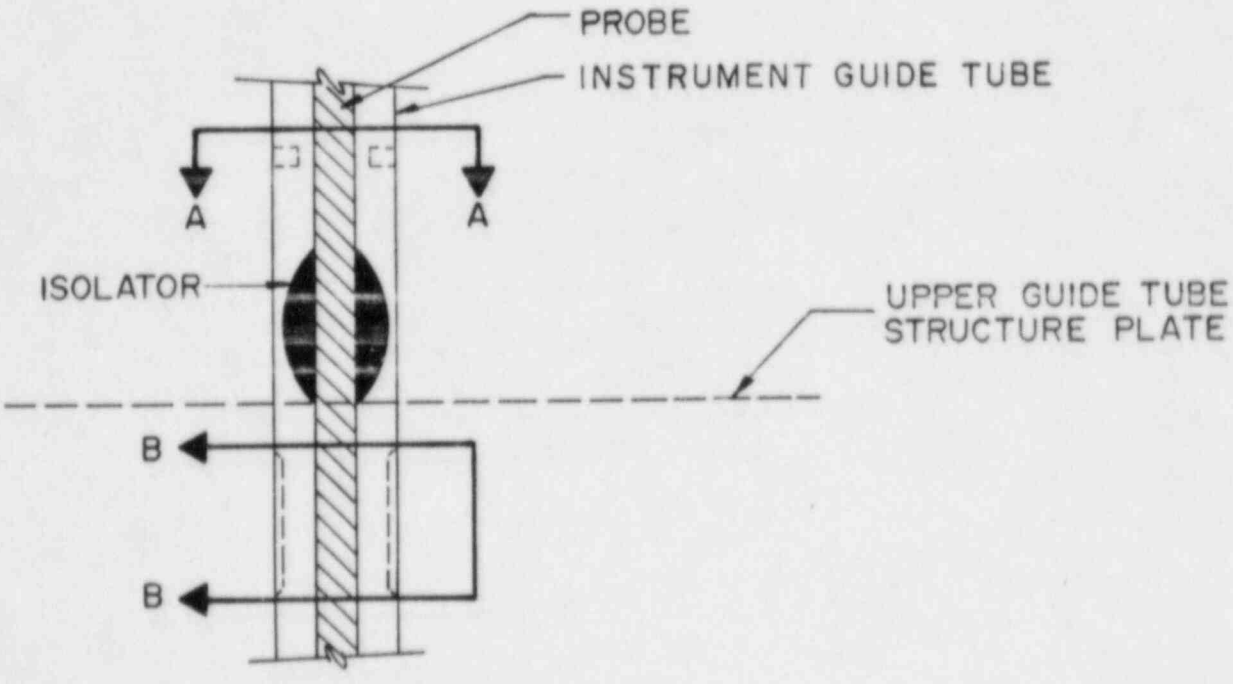


Figure 2 - DETAIL B

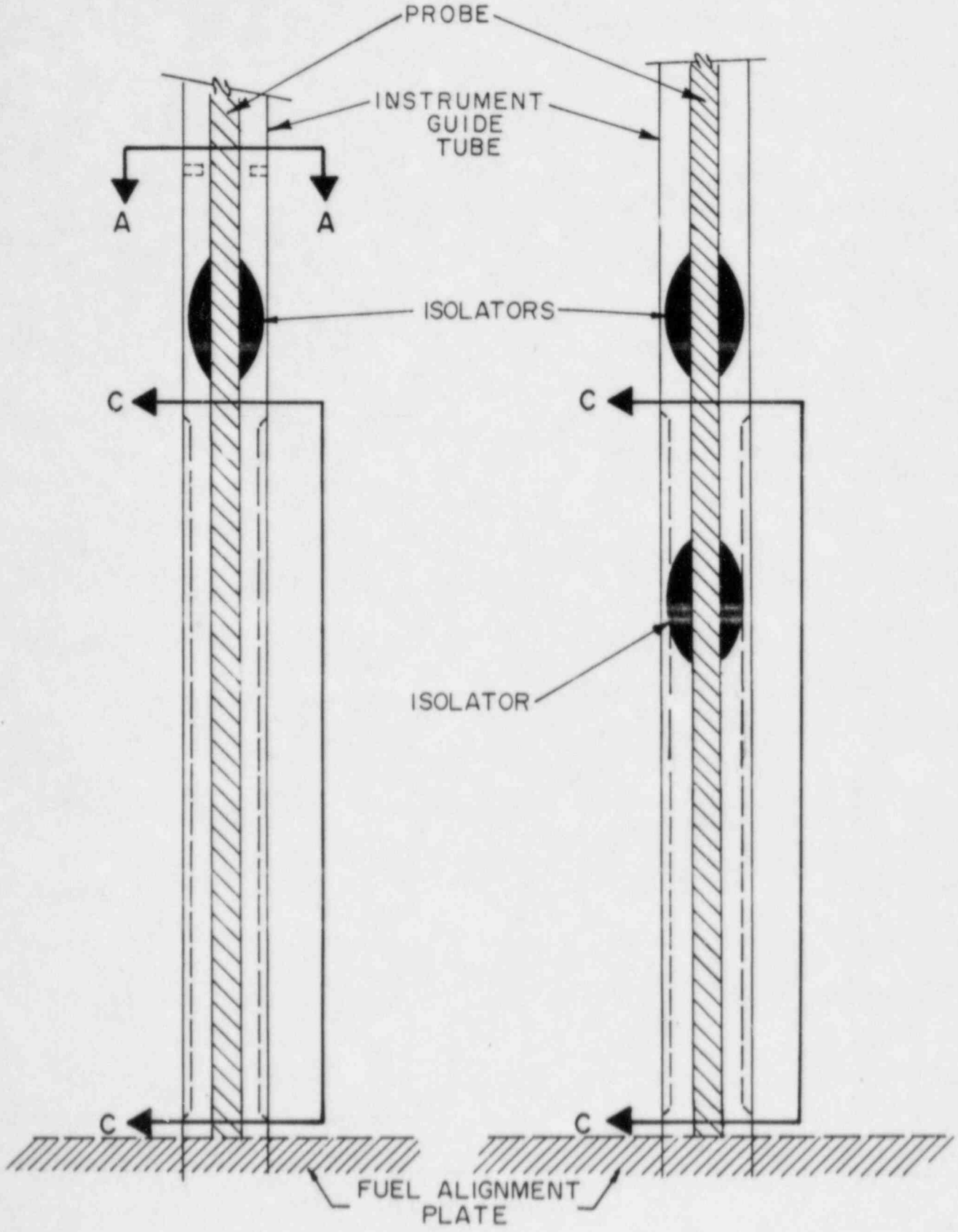


Figure 2 - DETAIL C

PREVIOUS DESIGN

EXISTING DESIGN

SECTIONAL VIEWS OF IGT MANOMETER EQUALIZING PORTS

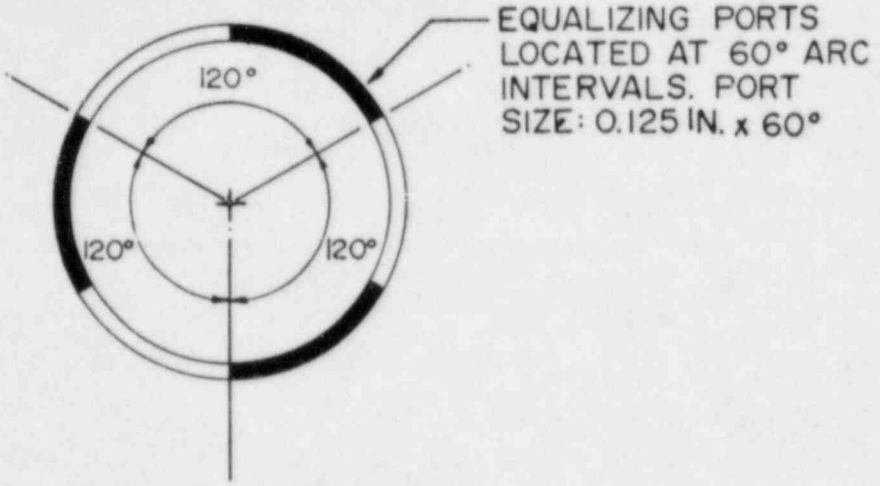


Figure 2 - SECTION A-A

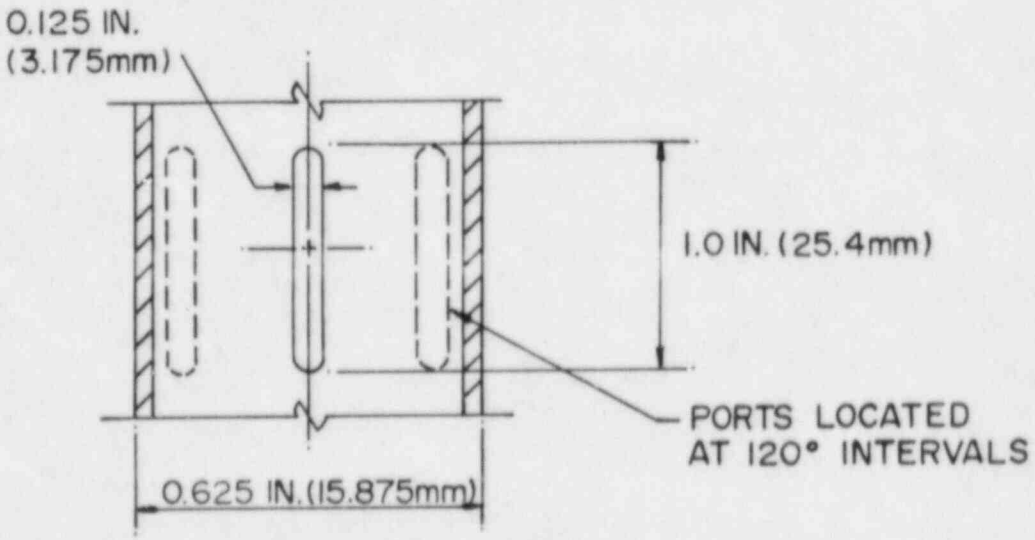


Figure 2 - SECTION B-B

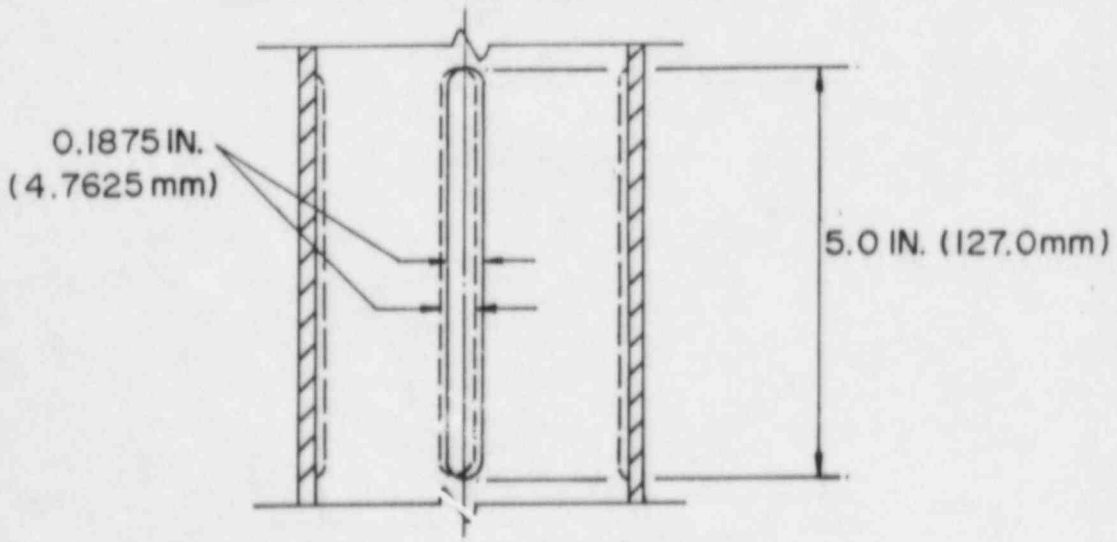


Figure 2 - SECTION C-C